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10/797,081	03/11/2004	Syuji Asano	01-592	4352

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RESTON, VA 20191

EXAMINER

LANDAU, MATTHEW C

ART UNIT PAPER NUMBER

2815

DATE MAILED: 05/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/797,081

Applicant(s)

ASANO ET AL.

Examiner

Matthew Landau

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 February 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) 7 and 8 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 3/11/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION*****Election/Restrictions***

Applicant's election with traverse of Group I in the reply filed on February 24, 2005 is acknowledged. The traversal is on the ground(s) that claim 6 is not a linking claim, and should be grouped with the invention of Group I. The Examiner agrees with Applicant that claim 6 should be grouped with claims 1-5. It is believed that was intent of the original restriction requirement. Claim 6 was labeled a linking claim because it was believed that it could not be properly restricted from the method claims. If Applicant had elected the method claims, claim 6 would have been examined as well. Since Applicant elected the device claims, it will be examined with the device claims.

The requirement is still deemed proper and is therefore made FINAL.

Claims 7 and 8 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on February 24, 2005.

***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the thin film resistance element through an interlayer insulating film (claim 1) must be shown or the feature(s) canceled from the claim(s). Note that claim 1 further states the upper surface of the interlayer insulating film is beneath the thin film resistance element, therefore the resistance element cannot be "through" the

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insulating film. The specification and drawings clearly disclose the resistance element is in fact above the insulating film. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Objections***

Claims 1 and 6 are objected to because of the following informalities:

Regarding claim 1, the limitation "a thin film resistance element through an interlayer insulating film" is objected to. The claim further states that the upper surface of the interlayer insulating film is beneath the thin film resistance element, therefore the resistance element cannot be "through" the insulating film. The specification and drawings clearly disclose the

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resistance element is in fact above the insulating film. It is suggested the word "through" be replaced with a more suitable alternative such as "over" or "above". Claim 6 has similar problems.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-5 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a taper angle greater than 0 degrees, does not reasonably provide enablement for a taper angle of 0 degrees. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. The claim limitation "10° or less" includes 0 degrees. However, the claim also requires "a step on the upper surface of the interlayer insulating film". If the taper angle as claimed was equal to 0 degrees, there would be no step. Therefore, the claim can only be enabled for a taper angle greater than 0 degrees.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4-6 are rejected under 35 U.S.C. 103(a) as obvious over Nagao et al. (US PGPub 2001/0053559, hereinafter Nagao).

Regarding claim 1, Figures 1 and 4 of Nagao discloses a semiconductor device having a thin film resistance element 111 through an interlayer insulating film (110 or 403) above an area where a wire (107 or 401) is formed on a semiconductor substrate (100 or 400), wherein a taper angle at which a line connecting the local maximum and minimum points of a step on the upper surface of the interlayer insulating film beneath an area where the thin film resistance element is formed intersects to the surface of the semiconductor substrate. Note that pixel electrode 111 inherently has a resistance and therefore can be considered a resistance element. Also note that Nagao discloses the device shown in Figure 1 is formed using the principles shown in Figure 4 (paragraph [0030]), so it also has the step and tapered angle shown in Figure 4. Nagao does not specifically disclose that the taper angle is 10 degrees or less. However, Nagao does disclose it is desirable to improve the flatness (paragraphs [0016] and [0033]). This is supported by the fact that Figure 1 appears to show the insulating film 110 has a completely flat surface. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Nagao by using a taper angle less than 10 degrees, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

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Regarding claim 2, Figure 1 of Nagao discloses the interlayer insulating film 110 comprises an inorganic spin-on-glass (SOG) film (paragraph [0031]) formed so as to cover the overall area below the area where the thin film resistance element is formed.

Regarding claim 4, Figure 1 of Nagao discloses the thin film resistance element 111 is formed on an area where the wire 107 is formed. Figure 4 of Nagao discloses a wire interval of 5-300 microns (based on subtracting "L" from "P", paragraph [0018]), although it is not clear if the same spacing is used for the wires 107 and 108 shown in the device of Figure 1. Therefore, it appears Nagao does not specifically disclose the wire interval is 1.7 microns or more. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the claimed wiring interval, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 5, Figure 1 of Nagao discloses the thin film resistance element 111 is formed above the area where the wire 107 is formed, and the thin film resistance element and the wire are disposed in parallel to each other so that the projections thereof are overlapped with each other. Note the pixel electrode 111 inherently extends in more than one direction. For instance, looking at Figure 1, the electrode 111 also extends into the page, making it parallel to the wire 107. Alternatively, it can be considered that electrode 111 is parallel to wire 107 in the sense that 111 is parallel to the width direction of the wire 107.

Regarding claim 6, Figure 1 of Nagao discloses a thin film resistance element 111 through an interlayer insulating film 110 above an area where a wire 107 is formed, wherein the

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insulating film comprises an inorganic SOG film (paragraph [0031]) formed so as to cover the overall area below an area where the thin film resistance element is formed.

Claims 1, 3, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiiki et al. (US PG PUB 2002/0020879, hereinafter Shiiki) in view of Nagao.

Regarding claim 1, Figure 1A of Shiiki discloses a semiconductor device having a thin film resistance element 2 through an interlayer insulating film 3 above an area where a wire (4 or 6) is formed on a semiconductor substrate. Shiiki does not specifically disclose a taper angle at which a line connecting the local maximum and minimum points of a step on the upper surface of the interlayer insulating film beneath an area where the thin film resistance element is formed intersects to the surface of the semiconductor substrate is set to 10 degrees or less. Figure 4 of Nagao discloses a method of forming an interlayer insulating film 403 over wires 401, wherein the upper surface of the insulating film has a small step. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Shiiki by using the method of Nagao for the purpose of obtaining a relatively flat surface (paragraph [0033] of Nagao) without requiring any additional planarization steps, such as CMP. A further difference between Shiiki and the claimed invention is the taper angle is less than 10 degrees. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Shiiki and Nagao by using a taper angle less than 10 degrees, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).



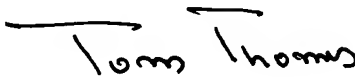
Regarding claim 3, since the step in the insulating film is formed as a result of the underlying wiring 6, and that wiring is located under the resistance element, it follows that an upper surface of the interlayer insulating film has a higher area adjacent to an area where the thin film resistance element is formed than in an area where the resistance element is not formed (see Figures 1A and 1B of Shiiki). It is further obvious to use the inorganic SOG film of Nagao for the purpose of using an insulating material that can function as a good leveling film.

Regarding claim 6, Figure 1A of Shiiki discloses a thin film resistance element 2 through an interlayer insulating film 3 above an area where a wire 4 is formed, wherein the film is formed to cover the overall area below an area where the thin film resistance element is formed. It is obvious to use the inorganic SOG film of Nagao for the purpose of using an insulating material that can function as a good leveling film.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (571) 272-1731.

The examiner can normally be reached from 8:30 AM - 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

  
TOM THOMAS  
SUPERVISORY PATENT EXAMINER

Matthew C. Landau

May 13, 2005